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TRANSMITTAL LETTER (General - Patent Pending)	Docket No. L9289.00121

In Re Application Of: Kuniyuki KAJITA

MAR 23 2006
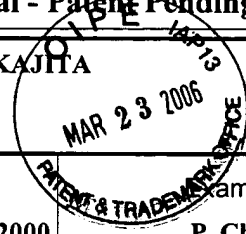
Application No. 09/701,433	Filing Date November 29, 2000	Examiner P. Chung	Customer No. 24257	Group Art Unit 2138	Confirmation No. 9782

Title: RADIO COMMUNICATION APPARTUS AND CODING PROCESSING METHOD

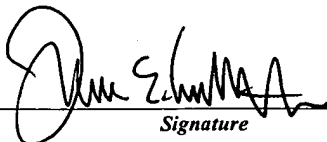## COMMISSIONER FOR PATENTS:

Transmitted herewith is:

the Reply Brief in this application, with respect to the Examiner's Answer sent on January 23, 2006.

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James E. Ledbetter, Esq.
Registration No. 28,732
Stevens, Davis, Miller & Mosher, LLP
1615 L Street, N.W., Suite 850
Washington, DC 20036
Tel: 202-785-0100
Fax: 202-408-5200

Dated: **March 23, 2006**

cc:

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In re the Application of

Inventor(s):	Kuniyuki KAJITA	Art Unit 2133
Appln. No.:	09/701,433	Exr. P. M. Chung
Filed:	November 29, 2000	
For:	RADIO COMMUNICATION APPARATUS AND CODING PROCESSING METHOD	

REPLY BRIEF

Assistant Commissioner of Patents
Washington, DC 20231

Dear Sir:

This Reply Brief is submitted in order to rebut various arguments set forth in the Examiner's Answer of January 23, 2006.

It is submitted that all pending rejections are unwarranted and should be reversed.

First of all, the Appellant wishes to explain the functions of each of error correction coding, interleaving and rate matching.

Error correction coding, such as convolutional coding and turbo coding, is used for correcting the errors in received data. Interleaving is used for improving resistibility to burst errors of data. And rate matching is used for adjusting the data length of data, e.g., repeating bits of data which are shorter than a requested length or puncturing bits of data which are longer than the requested length. Also, as an adventitious function, rate

matching is operable to equalize the resistibility to the error of the whole data, as discussed in detail hereinafter, by repeating or puncturing of a part of bits in the whole data, preferably at a regular interval. Accordingly, the functions of these operations are completely different.

The present inventor discovered that the prior art technique, shown in application Figs. 1A and 1B, suffers from burst error problems because the interleaving following the repeating (rate matching) causes unequal resistibility to the error of the whole data, the resistibility of which was equalized by the repeating (rate matching).

Therefore, to prevent the resistibility from being unequalized, a coding process of performing the error correction coding, then the interleaving, and then the rate matching, was conceived by the present inventor. That is, the present invention claimed provides a coding process which has advantages of both _improving_ the error resistibility and _equalizing_ the error resistibility and of achieving high resistibility to burst error. The improving and equalizing of the resistibility provides the further advantage of improving the performance of the error correcting at the receiver (decoding process).

Also, in the present claimed invention, another advantage is obtained in that the interleaving does not need to be adapted to

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various data rates. That is, in the present invention, data input into the interleaving has a predetermined rate because the interleaving is performed immediately after the error correction coding. Therefore, the interleaving does not need to be adapted to many data rates accompanied with the rate matching.

Page 4 of the Examiner's answer states that "However, it would have been obvious ... to set the rate matcher to either the rate matching followed by interleaving ... to reduce burst error or interleaving followed by rate matching ... to reduce burst error." (The advisory action stated the purpose as "to reduce latency" and the Appellant pointed out in the main Brief that this statement is unclear). The Examiner's Answer also states that "Therefore, it would have been obvious ... to combine the rate matching of Frenger into the interleaving performed after coding of Chen to rate match for reducing burst error."

However, the Appellant submits that, in the view of a person skilled in the art at the time the present invention was made, the main function of the rate matching is to adjust the data length. The reduction of burst error is neither a motivation nor a rationale for combining the rate matching of Frenger into Chen. In other words, the reduction of burst error is achieved by the interleaving, and the interleaving is disclosed in Chen without need to refer to Frenger.

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The sentence bridging pages 6 and 7 of the Examiner's Answer state that "However, the admitted prior art, in the receiver side, teaches that a signal received by a reception antenna is subjected to predetermined radio processing and demodulation processing and so forth before inverse rearrangement against the interleaving is performed in the de-interleaving. In this rearranged data, the number of bits which are increased or decreased in the transmitter side once are decreased or increased in the puncturing or repeating section." (The Appellant notes that this is not described at all in the Final Office Action or the Advisory Action.) Also, page 7, line 9 et seq. states that "However, since, in the transmitter side, the order of interleaving before or after rate matcher is obvious ... to reduce burst error" (This also is not described at all in the Final Office Action or the Advisory Action). However, as pointed out above, this is not a rationale for being obvious.

Regarding Section 10 "Response to Argument" of the Examiner's Answer, first of all, it is unclear what is meant by the first and second paragraphs of this section. If the Examiner's Answer is proposing that Appellant's argument is unsupported that Frenger does not disclose a single device employing both repeating and puncturing, the Examiner's Answer is based on an explicit misunderstanding of Frenger. Frenger is primarily directed to use of rate-compatible punctured convolutional codes (RCPC-codes), and

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discloses a convolutional code concatenated with a repetition code for purposes of showing the superiority of the RCPC-codes. This is clear from the description in the Abstract and Section V ("COMPARISON TO REPETITION ENCODING") of Frenger. Therefore, in the view of one of ordinary skill in the art, it does make sense to take a position that Frenger does not contemplate that both repeating and puncturing are employed with a single device and does not contemplate to alternatively select between repeating and puncturing as a positive (mandatory) operation in the rate matching.

Regarding the third paragraph of Section 10, it is noted that the second "sentence" of this paragraph is incomplete and unable to be understood by the Appeallant. Further, the basis for the allegations in the third and fourth sentences is unclear. The rejections should not be sustained based upon such unclear statements.

In the paragraph bridging pages 8 and 9, it is proposed that "Therefore, one of ordinary skill ... would have known that Frenger uses only one convolutional encoder with embedded rate matcher that comprises a puncture and a repetition, wherein the rate matcher alternatively selects between repetition and puncture. (See pg. 354, section II: RCPC-Codes for Rate Matching)." However, as mentioned above, such subject matter has not been known prior to

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the present invention. Section II of Frenger cited by the Examiner's Answer describes that "An alternative way to perform rate matching is to have a higher rate convolutional encoder concatenated with a repetition encoder that simply repeats some of the bits before transmission." It should be noted that the higher rate convolutional encoder is different from the RCPC-Codes in Frenger, so that it is unclear how the higher rate convolutional encoder is merged with the RCPC-Codes and how the repetition concatenated with higher rate convolutional encoder is operable in the RCPC-Codes.

In the second full paragraph of page 9, it is stated that "Examiner disagrees with applicant because nothing spectacular about placing interleave before or after since it serves a distinct purpose from rate matching is for burst error." First of all, this sentence is unclear as to the intended meaning. Secondly, if the Examiner's Answer is stating that the purpose of rate matching is different from that of the interleaving which is used for reducing bust error, it weakens the Examiner's argument concerning combining Frenger with Chen. That is, as mentioned above, the reduction of burst error cannot be a motivation for combining the rate matching taught by Frenger with Chen.

Concerning the comments starting at page 9, line 10 of the Examiner's Answer, the Appellant notes the followinig.

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Section 9 of the Examiner's Answer states that the grounds of rejection are (1) an obviousness rejection based on Chen in view of Frenger and (2) an obviousness rejection based on Chen in view of Frenger and the admitted prior art. Although Section 10 of the Examiner's Answer (entitled "Response to Argument") discusses new references by Akihiko, Wang and Moroney et al., these newly discussed documents have not been asserted or relied upon as a ground of rejection.

Under MPEP 1207.03, if new references are relied on in an examiner's answer other than for minor matters, a new ground of rejection must be asserted. MPEP 1207.03 specifically requires that a new ground of rejection in an examiner's answer must be prominently identified in the "Grounds of Rejection to be Reviewed on Appeal."

Further, MPEP 1207.03 at page 1200-37 states: "A new prior art reference applied or cited for the first time in an examiner's answer generally will constitute a new ground of rejection. If the citation of a new prior art reference is necessary to support a rejection, it must be included in the statement of rejection, which would be considered to introduce a new ground of rejection. Even if the prior art reference is cited to support the rejection in a minor capacity, it should be positively included in the statement of rejection. In re Hoch, 428 F.2d 1341, 1342 n.3, 166 USPQ 406,

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407 n. 3 (CCPA 1970). Where a newly cited reference is added merely as evidence of the prior statement made by the examiner as to what is "well-known" in the art which was challenged <u>for the first time in the appeal brief</u>, the citation of the reference in the examiner's answer would not ordinarily constitute a new ground of rejection within the meaning of 37 CFR 41.39(a)(2). See also MPEP § 2144.03." (emphasis added)

In the present case, the Board cannot properly consider the Akihiko, Wang and Moroney et al. documents as part of the pending rejections, because the examiners did not include a new ground of rejection in Section (9) of the examiner's answer.

In any event, the Appellant submits the following comments on these newly discussed documents.

Regarding "Study on Wideband CDMA System in Burst Error Environment" by Akihiko Watanabe et al., the Appellant notes that, in Watanabe, the rate matching is performed for adjusting the data length to a frame length, and there are a variety of frame lengths depending on the service and data to be transmitted. Therefore, the rate-matching needs to be adapted to repeat or puncture a part of the bits of a bit sequence as well as to repeat every bit of the bit sequence. In the case that every bit is repeated, the unequalizing of the resistibility to the error does not arise due to the interleaving because there is no difference in the

resistibility to the error for each bit (because there are no non-repeated bits). On the other hand, in the case that only a part of the bits is repeated or punctured, the unequalizing of the resistibility to the error arises due to the interleaver because there is a difference in the resistibility to the error between bits (because some bits are repeated and others are not; that is, the repeated bits have higher resistance). In other words, a repeated bit has high resistibility to error compared with a non-repeated bit, and a non-punctured bit has high resistibility to the error compared with a punctured bit. Thus, it could arise that bits which have low resistibility to error are gathered in a portion of the bit sequence (unequalizing of the resistibility to the error) due to the interleaving.

The present inventor recognized the problem of the unequalizing of the resistibility of the error in the case that a part of the bits is repeated or punctured as explicitly recited in independent claims 11, 19, 23 and 31.

On the other hand, in Watanabe, the repetition repeats every bit as described in lines 12-14 in the left column of page 325. This is also clear from Fig. 1 which shows 64 Kbps as output from the repetition of input bits as 32 Kbps. That is, Watanabe repeats every bit and never a part of the bit sequence. Therefore, in Watanabe, there is no recognition of the problem to be solved by

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the claimed invention, so that there is no advantage of performing the interleaving before rate matching. Actually, Watanabe's Figs. show that the repetition followed by interleaving (Rep-Int method) is superior to the interleaving followed by the repetition (Int-Rep method).

Moreover, Watanabe does not disclose the rate matching defined in the Appellant's claims which comprise alternatively repeating and puncturing.

Further, as recited in dependent claims 13 and 25, the repetition and the puncturing of the part of the bits are performed at regular intervals in order to adequately equalize the resistibility to the error for the bit sequence in the case that a part of the bits is repeated or punctured. None of references disclose this feature, and thus these claims provide a further basis for allowability.

Regarding "Asymptotic performances of Non-repetitive and Repetitive Turbo Codes" by Wang, it should be noted that this reference was cited in a previous Office Action and was later withdrawn. Regarding Wang, the Appellant notes that it relates to Turbo Codes. As is well known, the Turbo Codes comprise one interleaver and two constituent encoders as shown in Fig. 1 of Wang, and Wang discloses the repeating performed before or after interleaving. However, as clearly described in the paragraph of

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page 51, cited by the Examiner's Answer, the repeating is performed within the Turbo Code which is one of the error correction coding. This is also clear from the fact that the encoding is performed after the repeating and the interleaving. That is, the repeating of Wang is a part of the Turbo Coding (error correction coding) not the rate matching of the claimed invention. Also, Wang does not disclose the puncturing in the rate matching.
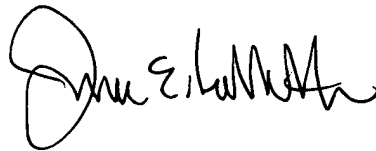
Regarding USPN 5,771,239 to Moroney et al., the Appellant notes that it discloses encoding followed by an interleaving and randomizing the punctured convolutional encode. The Examiner's Answer refers to the punctured convolutional encoder as a rate matcher, but the punctured convolutional encoder is one of the error correction coder, and the puncturing of Moroney is a part of the convolutional encoder not the rate matching of the claimed invention. Furthermore, Moroney does not disclose repeating in the rate matching.

Regarding the Examiner's argument described in the second full paragraph of page 10, the Appellant notes that the only motivation to conceive the claimed invention is to find out the unequalizing occurred due to the interleaving performed after the rate matching and to strengthen the resistibility to the burst error. However, all of the newly cited references as well as already cited references fail to provide such a motivation.

At page 11, the Examiner's Answer states that "the order of interleaving before or after rate matcher is obvious ... to reduce burst error." However, as discussed in detail above, this fails to provide a rationale for supporting the present obviousness rejections.

In view of the above arguments and those made in the main Brief, it is submitted that the rejections of all pending claims are unwarranted, and it is requested that this honorable Board reverse the same.

Respectfully submitted,

James E. Ledbetter
Registration No. 28,732

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JEL/att
ATTORNEY DOCKET NO. L9289.00121
STEVENS, DAVIS, MILLER & MOSHER, L.L.P.
1615 L Street, NW
P.O. Box 34387
Washington, DC 20043-4387
Telephone: (202) 408-5100
Facsimile: (202) 408-5200